Editorial

One minute to assess frailty, but what should we do next?

The capacity to limit age-related diseases has been proposed as one of the main mechanisms responsible for successful ageing in old individuals. Indeed, age-related decline in physiological systems has been suggested to result in an increased likelihood of frailty occurring. Fried et al. [1] suggested patients with frailty present with at least three of the following; weight loss; exhaustion; a reduction in physical activity; and reduced mobility and grip strength. Factors that are associated with frailty include: age; comorbidities (e.g. hypertension); behavioural habits (e.g. exercise, smoking, & alcohol consumption) [2]; and those patients at both extremes of body mass [3]. The majority of these factors are potentially reversible, except for age and comorbidities, the latter of which could be managed or controlled. Frailty is a debilitating condition that reduces the quality of life in elderly populations [2], which is unsurprising, as it has previously been correlated with disability [3]. However, it is important to note that disability and frailty are different entities, and being disabled is not a prerequisite for frailty [4]. Nevertheless, frail individuals are often less able to perform the activities of daily living that promote independence.

Pre-operative frailty in patients has been linked with increased postoperative morbidity [5], including delirium [6], sepsis [7], prolonged hospital stay [5] and postoperative re-admission [8], compared with non-frail counterparts. Moreover, Fried et al. [4] suggest that frail patients may also suffer from a 'vulnerability to stressors'. Indeed, the prospect of having surgery and accompanying medical examinations and investigations will be a considerable stressor to the frail patient, which may further exacerbate their level of 'vulnerability'. Even though it may be difficult to reverse the deleterious effects of severe frailty in patients before surgery, it has been shown that moderate or borderline frailty is responsive to a targeted intervention [9]. Therefore, identifying patients that are frail, or at risk of developing frailty postoperatively, is important. Specifically, the correct diagnosis of frailty in the pre-operative setting affords the opportunity to implement interventions aimed at optimising the patient before surgery.

The study of O'Neil et al. [10] in this issue of *Anaesthesia* investigated the utility of assessing pre-operative vascular patients for frailty via 'clinical impression'. Three hundred and ninety-two patients were assessed in pre-assessment by a healthcare professional (i.e. consultant anaesthetist or specialist nurse) for their 'clinical impression' as to whether the patient was deemed to be 'fit for the proposed operation', and thus considered as being 'non frail'. Study follow-up on incidence of mortality demonstrated that patients deemed to be 'frail' had a 2.44 increased likelihood of dying at any given postoperative time point compared with those deemed 'not frail'. Moreover, a striking feature of the study was that 20% of the 'frail' patients had died at 13 months, compared with 34 months in the 'not frail' patients, suggesting pre-assessment clinical judgement was associated with mortality outcome. Despite these interesting results, it is questionable whether a 'clinical impression' truly identifies 'frail' and 'non-frail' patients. Unfortunately, O'Neil et al's study did not provide comparison with previously validated assessment tools e.g. the timed up and go test (TUG) [11]. Therefore, further research is required to identify whether a 'clinical impression' is able to provide a valid assessment of frailty. However, frailty aside, it is interesting that the 'clinical impression' did appear to identify those at risk of a poor postoperative

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outcome. By assessing postoperative complications alongside 'clinical impression' it might be possible to identify specific complications that 'frail' patients are more likely to experience. In turn, targeted peri-operative strategies could be put in place for this patient population.

Geriatric patients should be assessed for their level of frailty pre-operatively, according to both the American College of Surgeons National Surgical Quality Improvement Program and the American Geriatrics Society [12], and the Association of Anaesthetists of Great Britain and Ireland [13]. However, frailty has recently been described as 'the elephant in the operating room', as it is often not diagnosed or treated peri-operatively [14]. Indeed, despite the ease by which frailty can be assessed [11], and its association with post-operative outcome [5], it is not currently explicitly included within the National Institute for Health and Care Excellent (NICE) guidelines for pre-operative tests [15]. Therefore, routine assessment of frailty is not consistently implemented across UK pre-assessment centres. If we are failing to identify patients who are frail, it is difficult to formulate pre- and postoperative strategies to enhance the potential for a successful surgical outcome.

O'Neil et al. [10] clearly demon strate the initial subjective evaluation of a patient has the potential to be a useful tool in evaluating frailty, and therefore those at heightened risk for postoperative mortality. The clinicians used by O'Neil et al. were all experienced at assessing vascular patients, thus whether these findings are transferable to other clinicians that do not routinely assess this subset is questionable. In this regard Hubbard et al. [14] suggest that subjective measures of frailty may be limited by their inter-rater agreement. The assessment and diagnosis of frailty should be equally accessible for healthcare professionals who occasionally encounter frail patients, and those who do so on a routine basis (i.e. geriatricians) [14]. Thus, perhaps the combination of more objective measures, such as the TUG test, in addition to a 'clinical impression', might be more ameliorable for those clinicians who have less experience identifying frailty within patients.

Various risk factors based on past history, clinical examination and investigations, have been shown to correlate with postoperative outcome after surgery [16]. Moreover, previous literature has demonstrated a relationship between cardiorespiratory capacity and post-operative complications as measured by cardiopulmonary exercise testing (CPET) [17], and the six-minute walk test [18]. Cardiopulmonary exercise testing measures have been shown to be able to distinguish those patients at risk of specific postoperative complications (i.e. cardiac or respiratory) [17]. Barakat et al. [17] demonstrated that CPET-derived measures of anaerobic threshold and ventilatory equivalents for CO_2 ($\dot{V}E/\dot{V}CO_2$) are predictive of postoperative cardiac and respiratory complications in vascular patients. Patient data obtained from CPET during pre-assessment can in turn be used to estimate survival and postoperative risk. One such survival calculator has recently been presented in *Anaesthesia* [19]. This survival calculator encompasses several pre-operative measures including: age; weight; height; blood results (i.e. creatinine, haemoglobin); previous medical history; and CPET findings. Carlisle et al. [19] demonstrated significantly lower five-year mortality in those patients stratified by the risk calculator as 'medium-to-high risk' in comparison with those classified 'high risk', with a hazard ratio of 0.58. This indicates a 42% reduced likelihood of mortality in 'medium-to-high risk' vs. 'high-risk' patients. Carlisle et al's data provide encouraging evidence as to the utility of risk calculations within the peri-operative setting, but unfortunately they do not include any specific measures of frailty. Including a measure of 'frailty' and/or 'clinical impression' as a variable within the risk calculation may therefore further improve its predictive ability. However, it is currently difficult to accurately quantify risk in elderly patients for several reasons: 1, the peri-operative literature within this population is sparse; 2, interpretation of the peri-operative literature is confounded by discrepancies in the tools used to identify postoperative outcome measures, and variability regarding the post-operative day at which outcome measures (i.e. complications) were recorded [20]; 3, most of the current tools to assess postoperative outcome measures are also not specific to the elderly; 4, hospital-specific outcome measures (e.g. length of stay, mortality,

complications, re-admission) may not be in line with what patients want to know before making a surgical decision, and elderly frail patients may be more inclined to assess the likelihood of being discharged to home/residential care, or other more patient-specific outcomes [20]. Addressing the limitations of the current literature to allow for a more accurate quantification of risk in the elderly, and refinement of mortality risk estimations, must be a key priority for future research in the area.

Following the identification of frailty and a medium-high level of risk in pre-assessment, it is important that strategies are put in place to improve a patient's likelihood for a beneficial postoperative outcome. Indeed, there are studies assessing the effect of pre-operative exercise training on the frail population that have demonstrated some reversibility of the condition [21,22]. When considering surgical patients, pre-operative exercise training is often termed 'prehabilitation' and is seen as an intervention designed to enhance functional capacity in anticipation of the forthcoming surgical insult. Hoogeboom et al. [21] demonstrated that in-hospital prehabilitation training (aerobic and strength based training, twice a week for three to six weeks) afforded clinically meaningful reductions in the time to perform the TUG test in frail patients undergoing orthopaedic surgery. Hoogeboom et al's study found a 4.4 second reduction in the time taken to do the TUG test, which is 3 seconds greater than the predefined clinically beneficial reduction in the TUG test [23]. Unfortunately, Hoogeboom et al. [21] did not follow patients postoperatively to assess the impact of their training intervention on outcome measurements. A more recent case report [22] demonstrated a four-week prehabilitation programme (including moderate aerobic and resistance exercises with nutritional counselling) led to progressive and 'remarkable' improvements in the patient's level of frailty prior to his radical cystectomy. The case report also documents no adverse events during or after surgery, and a timely discharge on the seventh postoperative day. Combining this kind of multimodal approach to prehabilitation, with a similarly targeted rehabilitation programme after surgery, may afford a better long-term prognosis for the frail patient. Indeed, a 12-week post-operative resistance exercise programme (three times a week of progressive knee extension and leg press exercises) increased elderly hip replacement patient's stair walking power and muscle peak torque compared with a standard rehabilitation programme (one hour per day of functional exercises to improve mobility and strength without external loading) [24]. Rehabilitation may therefore also act to prevent those patients that are borderline frail from developing postoperative frailty, although this is yet to be explored.

By combining 'clinical impression' with simple objective tests such as the TUG, it could be possible to include a time-efficient assessment of frailty as part of routine pre-assessment clinical decision-making. The inclusion of a measure of frailty within pre-assessment has the potential to enable the planning of individualised patient optimisation strategies in both the pre- and postoperative stages. However, although there is some literature-based evidence of positive outcomes following the use of multi-modal prehabilitation and rehabilitation strategies in frail patients, more research is clearly required. Performing longitudinal and multicentre intervention studies using targeted prehabilitation and rehabilitation of frail patients may improve our understanding of how to optimise these patients both pre- and postoperatively, with the aim of improving the prognosis of a positive postoperative outcome.

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